



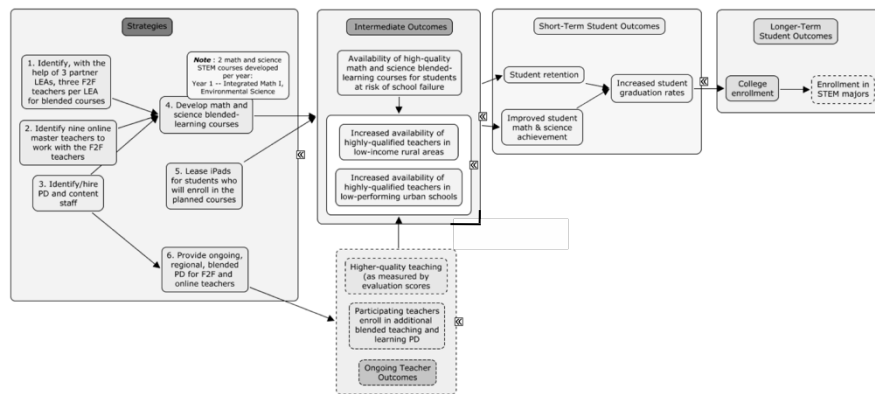
The NCVPS STEM Initiative: Blended Learning for At-Risk Students

Kevin Oliver, Associate Professor of Instructional Technology
North Carolina State University

RttT Outcomes at NCVPS

- + as part of NC's RttT grant, NCVPS designed a STEM initiative to increase at-risk students' access to math and science courses and high quality teachers
- + the initiative involves:
 - + creating a STEM course model (grand challenges, project-based learning)
 - + creating a blended instructional model (online and F2F teachers partnering in support of at-risk learners, with specified roles)
 - + developing six unique STEM courses over three years (3 math, 3 science)
 - + piloting courses in three underserved districts

Logic Model: NCVPS STEM Initiative

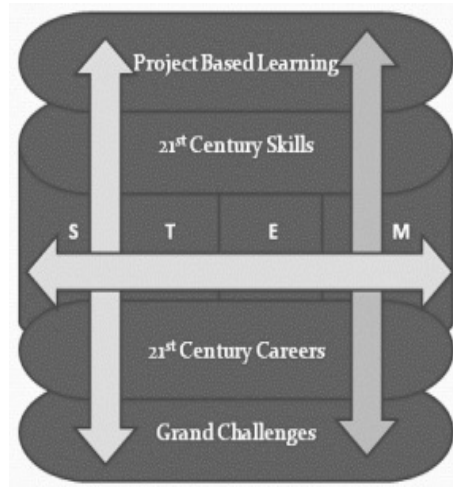


Course Development

- + developing six courses to be taught fully online (future), and in F2F classroom with blended support of both online and F2F teacher (pilot):
 - + integrated math I, II, and III
 - + earth/enviro science, forensics, and genetics
- + blended approach is an instructor blend, not the traditional reduction in seat time by moving part of a course online
- + each course will have four long-term projects
- + development pairs--NCVPS course developers and online teachers working together to design projects

STEM Instructional Framework

vertical and horizontal integration: project-based learning will incorporate 21st century skills, careers, and grand challenges, within the context of STEM

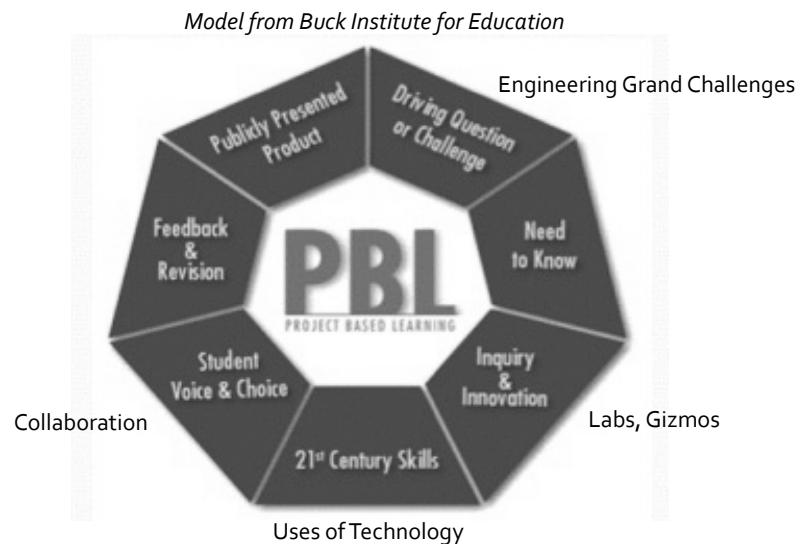


Grand Challenges

- + National Academy of Engineering, invited international group of technological thinkers to identify Engineering's grand challenges for the 21st century
- + 14 challenges made the list, including how to: make solar energy affordable, restore and improve urban infrastructure, advance personalized learning, advance health informatics, provide access to clean water, secure cyberspace
- + <http://www.engineeringchallenges.org/>



Project-Based Learning



Development Process

- + step 1: begin with the end in mind (final outcomes, NC Essential Standards, Common Core, 21st Century Skills)
- + step 2: craft the driving question (real-world application of standards, open-ended questions, scenarios)
- + step 3: plan the assessment (quizzes, presentations, demonstrations, essays)
- + step 4: map the project (scaffolding activities, labs, lessons, workshops)
- + step 5: manage the process (how virtual, F2F teacher collaborate around student learning)
- + had a project-based learning expert group the content that needed to be covered into projects

Sample Earth/Environmental Science Project

- + project deliverable--recycle food waste
- + curriculum--scientific method and thinking, earthquakes, volcanoes, plate tectonics, oceans, ecology, ecosystems, cycles (nitrogen, carbon), geological time
- + grand challenge--manage the nitrogen cycle
- + career tie-in's--natural disaster response, oceanographer, anthropologist, geologist
- + 21st century skills--global awareness, environmental literacy, health/wellness awareness, life/career skills, media/technology skills

Sample Integrated Math I Project

- + project deliverable--create a plan for city council
- + curriculum--linear functions, slope of a line, rate of change, modeling linear data patterns, solving linear equations, equivalent linear expressions, vertex-edge graphs, mathematical modeling, algorithmic problem solving, optimization
- + grand challenge--restore and improve urban infrast.
- + career tie-in's--civil engineer, structural engineer, city planner
- + 21st century skills--civic literacy, environmental literacy, financial literacy, life/career skills, media/technology skills

Teacher-Teacher Communication

- + weekly synchronous call/webinar between online and F2F teacher: plan ahead for week, discuss concerns about student progress and plans to move them forward
- + daily asynchronous communication via a STEM co-teaching document (Google Docs): daily must-have's for a lesson, and reviewing past events

	A	S
1 F2F Teacher Name		
2 NCPS Teacher Name		
3 District, School		
4 Course		
5 Project 1 Date Range		
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Teacher-Student Communication

- online teacher posts daily announcements
- online teacher monitors student progress, contacts struggling students weekly, successful students every two weeks, documents synchronous contacts
- online teacher provides grading and feedback within 24 hours
- F2F teacher provides one-on-one instruction, guiding students through materials accurately

Project/Instructional Flow: Day 1

- + 20-day cycle for each project, 4 projects total
- + announce grand challenge, big idea
- + host live kick off event to motivate, peak interest, and describe STEM career and 21st century skill connections (e.g., video)
- + students generate driving questions to focus or guide their work
- + introduce student roles and project outcomes

- + F2F teacher drives the opening
- + online teacher supports content online

Project/Instructional Flow: Day 2

- + students create know/need to know lists, to accomplish their project
- + students given rubrics and project examples as guides/what it will look like at end
- + deadlines and checkpoints noted to help students pace themselves appropriately

- + F2F teacher drives the instruction, covers material
- + online teacher supports content online (e.g., reviews know/need to know lists)

Project/Instructional Flow: Days 3-15

- + students dig into project, work through lessons and mini-lessons (e.g., Gizmo interactions, multimedia resources, synchronous interactions)
- + vocabulary introduced
- + periodic assignments and assessments with prompt feedback
- + project deliverable completed

- + online teacher drives the instruction
- + F2F teacher complements and guides

Project/Instructional Flow: Days 16-19

- + four days spent editing a cumulative capstone product to address students' driving questions
- + post initial drafts on blogs, peer review activities
- + student presentations

- + F2F teacher drives the instruction
- + online teacher supports content online

Project/Instructional Flow: Day 20

- + celebration to share what everyone learned about the project
- + involving experts (e.g., live, video conference, or pre-recorded videos about different products required)
- + F2F teacher drives the event
- + online teacher supports (e.g., records screencast to congratulate class)

Evaluation Plan

- + mixed methods
- + quantitative (compare blended student end-of-course test data versus comparable students enrolled in F2F only and online only versions of the same courses; NC Teacher Evaluation Process)
- + qualitative (student focus groups, teacher interviews, surveys, CLASS observations)
- + goal: provide data and recommendations to assist NCVPS with decisions about continuing STEM initiative and expanding blended learning courses to further underserved districts and low performing students

Qualitative Instrument Development

- + literature review into blended learning research and theory with report noting recommended strategies, potential barriers, and potential impacts (i.e., things to inquire into for this project)
- + also noted--existing instruments and questions
- + items developed to evaluate NCVPS professional development around developing and teaching blended courses (i.e., is it promoting recommended blended learning strategies)
- + items likewise developed for student and teacher surveys, focus groups, and interviews

Sample Items (3 of 10) for Evaluating Developer PD

- + *developers were introduced to blended learning assets with a discussion of how weaknesses in one delivery method (e.g., face-to-face) can be overcome by strengths in another method (online), and vice versa (Akkoyunlu & Vilmaz-Soylu, 2006; Osguthorpe & Graham, 2003)*
- + *to define how much of the course should go online and which course objectives should be taught online with self-directed learning, developers were introduced to a range of student factors they must consider, including: student characteristics, developmental levels, and discipline (Barenfanger, 2005; Dziuban, Moskal, & Hartman, 2005)*
- + *developers were introduced to models for setting student expectations that they can embed in a blended course setting (e.g., establishing rules for learning and participation in groups) (Greener, 2008)*

Sample Items (3 of 9) for Evaluating Teacher PD

- + *teachers were introduced to recommended roles for co-instructors in a blended setting and/or strategies for coordinating teaching efforts (Barenfanger, 2005; Denis, 2007)*
- + *teachers were introduced to personal success strategies that may be taught in a blended setting to help students manage the self-directed portions of learning (e.g., learning to manage time wisely, self-regulating learning) (Aycok, Garnham, & Kaleta, 2002; Dziuban, Hartman, & Moskal, 2004)*
- + *teachers were introduced to strategies for managing students in a blended setting (e.g., providing prompt feedback, regularly notifying students of progress, inviting questions from students, increasing student-faculty contact) (Aycok, Garnham, & Kaleta, 2002; Martyn, 2003)*

Survey, FG, Interview Topics

- + attitudes toward blended learning (compared to traditional methods)
- + confidence in blended learning (comfort, challenge)
- + self-direction in blended learning (personal decisions, discipline)
- + blended barriers (lack of orientation, technology/Web access, technical support)
- + blended benefits (expanded materials, ability to review, info lit skills, study skills, self-direction)
- + blended community (interaction fostered, sense of belonging/commitment to a team)
- + teacher roles (appropriate "blend," online teacher's value add to a course and to F2F teacher's capacity)

Project Update

- + initial course developer and teacher training complete, with course development under way
- + training 1, F2F school visits (introduce Edmodo community, understand scope of work, STEM model)
- + training 2, four synchronous Wimba sessions on:
 - + blended STEM model (grand challenges, PBL)
 - + F2F/online teacher roles and responsibilities
 - + NCVPS course development approach
 - + course accessibility
- + training 3, day-long F2F session:
 - + pairing online teachers/dvlprs., online/F2F teachers, reviewing curriculum layout in reference to standards
 - + introducing NCVPS support staff
 - + looking at PBL samples and Moodle overview

Acknowledgments

- + thanks to Jennifer Nobles, NCVPS Division Director, and Tracy Weeks, NCVPS Chief Academic Officer, who provided background information on the NCVPS STEM Initiative for this presentation